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Fitting models of imperfect vaccines to pertussis incidence data

The resurgence of pertussis in some countries with high vaccine coverage (e.g. Canada, USA, UK) has highlighted how much we still do not know about the dynamics of this disease, particularly the type of immunity rendered by infection and vaccination. There has been much discussion on the different modes by which vaccines might fail. When a vaccine reduces the probability of infection upon exposure but does not eliminate it, this is called failure in *degree*. When the protection conferred wanes over time, this is termed failure in *duration*. Vaccines may also protect against disease but not infection and transmission. Towards the goal of determining the key features of the pertussis vaccine, we fitted an assortment of imperfect vaccine models to pertussis incidence data. Trajectory matching and Maximization via iterated Filtering (MIF) was used to obtain the maximum likelihood estimates of the model parameters using different observation models. The idea behind these algorithms and the results of its application to pertussis data will be presented.